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ABSTRACT

A thermoacoustic engine-generator that converts waste heat into electrical power. Thermal energy is converted to useful work via temperature-pressure amplification of periodic acoustic traveling waves in a compressible working fluid which cause the armature of a linear alternator to reciprocate and produce alternating current electrical energy. An external oscillator initiates reciprocating motion in the armature of a linear alternator. The armature is a combination fluid pump and fluid motor as well as the induction armature of a linear alternator. The pump end of the armature generates an acoustic traveling wave with each cycle of the armature. The traveling wave enters a waveguide-heat exchanger and is amplified in temperature, pressure and propagation velocity by thermal conduction of energy through the wall of the waveguide. The amplified traveling wave acts upon the opposite end of the armature, causing it to reciprocate within the magnetic field windings of the generator, and generate an electrical current as well as a new acoustic traveling wave. When the operating temperature gradient is attained across the hot and cold heat exchangers, the thermoacoustic engine-generator becomes acoustically resonant and self-regenerative, and will continue to operate as long as the thermal gradient is maintained. The theoretical conversion efficiency is dependent on the thermal gradient, and is 63% of Carnot.